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A Multi-beamlet High Current Injector for Heavy Ion Fusion

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Heavy ion fusion requires high current beams with high brightness. Thus the ion source and injector must produce, transport and match a space-charge dominated heavy ion beam into a transport channel of an induction linac. One way to overcome the space charge problem is to use small beamlets at low energy and then merge the beamlets, after gaining sufficient energy, to form a high current beam. Simulation had shown that the merged beam can have an acceptably low emittance. In a recently started experiment, we produced a high current beam (several 100 mA of Ar) by merging 119 high current density beamlets. The experiment is being done in two stages on a 500 kV test stand. We first tested the pre-accelerator at full voltage gradient to achieve high current density. In the second stage, the beamlets are converged to merge into an ESQ channel. Our goal is to confirm the emittance growth and to demonstrate the technical feasibility of building a driver-scale HIF injector. The experiment is scheduled to be completed by mid-FY05. Initial results will be presented.

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